

REMARKS

Claims 82-85, 88, 92, 93 and 97 are cancelled. Claims 80, 81, 86, 87, 89-91, 94-96 and 98 are amended. Claims 99 and 103 are added. Claims 80, 81, 86, 87, 89-91, 94-96 and 98-103 are now active and under consideration. Thus, claims 84-85, 92 and 97 withdrawn from consideration are cancelled.

Applicant wishes to gratefully thank Examiner Fisher and her supervisor for the recent helpful and courteous discussion conducted with his representative. The claim amendments and attendant remarks provided herewith are further thereto.

I. Prior Art Rejections

A. Claims 80-83, 86-90, 93 and 98 stand rejected under USC 103(a) as being unpatentable over Woodhouse (U.S. 2,237,826) in view of Kirk-Othmer.

However, neither cited reference, either alone or in combination would have rendered the present invention obvious to one skilled in the art at the time it was made. There are numerous reasons for this conclusion. The reasons are numbered by paragraph for the Examiner's convenience.

1. Woodhouse describes the use of sulfamic acid and/or indiscriminate salts of sulfamic acid therein, *only* to increase ammonium nitrogen availability. Metallic sulfamates, with or without sulfamic acid, would provide no ammonium.

Specifically, Woodhouse only discloses use of sulfamic acid and salts of sulfamic acid in the preparation of ammonium sulfamate which is *used as a nitrifying agent*.

In fact, Woodhouse substantively *teaches away* from the claimed invention as it would essentially teach one skilled in the art not to use a cation other than ammonium (NH_4^+) in order to obtain nitrifying activity.

2. In fertilizer mixtures containing salts of sulfates and phosphates and metallic salts of sulfamic acid, *the bivalent anions form substantially stronger bonds to metallic bivalent cations* from the salt of sulfamic acid *than the monovalent sulfamate anion, resulting in metal precipitation*, e.g., a solution comprising calcium sulfamate and sulfate precipitates calcium sulfate. Metallic micronutrients are added in small quantities to fertilizer mixtures therefore any metallic precipitation will deplete said mixture of its essential micronutrients. No chemical reaction occurs with respect to the formation of metallic sulfamate *throughout its mixture of acidic fertilizers and salts of sulfamic acid*.

In fertilizer mixtures containing salts of sulfates and phosphates and sulfamic acid, said *bivalent anions form substantially stronger bonds to metallic bivalent cations* from the salts of sulfates and phosphates *than the monovalent sulfamate anion*. Kirk-Othmer discloses that “*sulfamic acid readily forms various metal sulfamates by reaction with the metal or the respective carbonates, oxides, or hydroxides (p.122),*” not with metal nitrate or other soluble fertilizer salt.

3. In fertilizer mixtures containing salts of sulfate and phosphate, sulfamic acid and metallic salts of sulfamic acid, the *bivalent anions* from sulfates and phosphates *form substantially stronger bonds to metallic bivalent cations* from the salts of sulfamic acid *than the monovalent sulfamate anion, resulting in either displacement of metals from metallic sulfamate and/or precipitation of metallic sulfates or phosphates*, e.g. ferrous sulfate and ferrous phosphate precipitates. No chemical reaction occurs with respect to the formation of metallic sulfamate *throughout its mixture of acidic fertilizers and sulfamic acid and salts of sulfamic acid*.

4. Woodhouse involves the addition of nitrifying agent which *increases the formation* of ammonium-containing phosphate (p.1, left col., Ins 52-55, p. 1, right right col., Ins 1-5). Thus Woodhouse adds his nitrifying agent *to increase reactions* that require ammonium-containing sulfamate rather than metallic-containing sulfamate. Thus, *arguendo*, even if Woodhouse teaches a complete or improved fertilizer, as the Examiner purports, Woodhouse teaches away from such a chemical combination *by destabilizing it or by making it less complete of essential metals, either by displacement reaction or by precipitation of metals from metallic sulfamate*.

5. Further, Woodhouse clearly contemplates basic (i.e., pH>7) compositions/mixtures in order to maintain the nitrifying agent in the composition. The addition of ammonia would also ensure a basic pH. In contrast, the present plant nutrient compositions, both stock and diluted versions, are acidic. This required low pH renders these compositions water-solution stable and resistant to precipitation of metallic phosphates.

6. Further, Woodhouse involves the addition of a nitrifying agent which *increases the formation* of ammonium-containing phosphate (p.1, left col., lns 52-55, p. 1, right col., lns 1-5). Thus, Woodhouse adds his nitrifying agent *to increase reactions* that require ammonium-containing sulfamate rather than metallic-containing sulfamate. Thus, *arguendo*, even if Woodhouse teaches a complete or improved fertilizer, as the Examiner asserts, Woodhouse teaches away from such a chemical combination *by destabilizing it or by making it less complete of essential metals, either by displacement reaction or by precipitation of metals from metallic sulfamate*.

7. Additionally, neither of the cited references discloses or suggest the claimed fertilizer composition containing required components a) and b).

Clearly, one skilled in the art would not be put in possession of the claimed invention by even the combination of Kirk-Othmer with Woodhouse as Kirk-Othmer would fail to correct the basic pH requirement, i.e., with addition of ammonia, of Woodhouse. Moreover, one skilled in the art would be neither motivated nor enabled from the cited references to practice the claimed invention, and would, in fact, be taught away from the claimed invention.

Hence, this ground of rejection is unsustainable and should be withdrawn.

B. Claim 91 and 96 stand rejected under 35 USC103(a) as being unpatentable over Woodhouse in view of Kirk-Othmer in further view of Rodder (U.S. 5,981,441).

However, Rodder would have failed to have corrected the deficiencies of the former two cited references as Rodder merely discloses the use of methanol as a solvent.

Hence, this ground of rejection is unsustainable and should be withdrawn.

C. Claims 94 and 95 stand rejected under 35 USC 103(a) as being unpatentable over Woodhouse in view of Kirk-Othmer in further view of Oeriu et al (U.S. 3,537,838).

However, Oeriu et al would have failed to have corrected the deficiencies of the former two cited references as Oeriu et al merely disclose that free thiol (SH) groups aid in stimulating plant growth.

Hence, this ground of rejection is unsustainable and should be withdrawn.

D. Claims 80-82, 86-90, 93 and 98 stand rejected under 35 USC 103(a) as being unpatentable over von Locquenghien et al (EP 1033365A1).

However, this reference would have neither disclosed nor suggested the claimed invention to one skilled in the art. There are several reasons for this conclusion.

1. Von Locquenghien et al provide no direct disclosure that sulfamate salts, individually or collectively with sulfamic acid, is or may be used to react with metallic carbonates. Von Locquenghien et al neither disclose nor suggest that salts of sulfamic acid can be added to conventional or acidic fertilizer materials or that their combination results in complete or faster uptake fertilizers. Von Locquenghien et al equate diureides of dicarboxylic acids (*the product of reaction between chlorosulfonyl isocyanate to malonic diamide and metallic carbonates*) with *nitrifying agent and slow release fertilizer and not metallic sulfamate*.

2. The **process of making the diureide** that the Examiner attributes to the formation of **sulfamic acid compound** and then reaction with an aqueous M_2CO_3 and mixtures alone or in combination with other fertilizers containing of potash fertilizers and other compounds can be attributed to a method *other than a process of preparing a complete or improved fertilizer with metallic sulfamates*. Von Locquenghien et al disclose the use of sulfamic acid

and/or salts of sulfamic acid, **only** to **delay the release** of nitrogen and metals availability. No chemical reaction occurs with respect to the formation of metallic sulfamates ***throughout its use as a nitrifying agent***.

3. In the widely used reference, Chemistry of the Elements, Greenwood and Earnshaw, p. 741-742, 2nd edition, sulfamate salts are derived from amidosulfuric acid (better known as sulfamic acid) and are classified under **amides** derivatives of sulfuric acid.

4. Von Locquenghien et al use the reaction of chlorosulfonyl isocyanate with malonic diamide and metallic carbonate. In the same Chemistry of Elements (p. 743-744), these salts are classified **under imido and nitride derivatives of sulfuric acid**. Its “sulfamate” salts are therefore named **aminosulfonates**. This view is shared in Kirk-Othmer (p. 124-125, Vol. 23).

5. Von Locquenghien et al describe the use of a N- sulfamate, $[\text{HNSO}_3]^{-2}$ (p. 5, left col., line 45-46). The difference between the sulfamate ion, $[\text{H}_2\text{NSO}_3]^{-2}$, and the N substituted sulfamate $[\text{HNSO}_3]^{-2}$ result in products with quite different physical and chemical properties.

6. In Von Locquenghien et al, malonic acid diureide bis (potassium sulfonate) (Table 3) is ***“sparingly soluble in water” and “suitable as source for slowly released plant nutrients”*** (p. 2, right col., line 21-23). Its release is affected by many weather related variables, including temperature, rain, soil moisture and pH, humidity, etc.

7. In contrast, **metallic sulfamate salts are “quite water-soluble”** at 25 degrees centigrade. (Kirk-Othmer, p. 125, Vol 23). In terms of molecular weight, the NH_2 part of the sulfamate is the closest to the oxygen molecule it replaces in a sulfate. But, taking the hydrogen away from the NH_2 in a sulfamate and replacing it for a diurea may have a strong and adverse effect on water solubility.

8. As a result, metallic sulfamate salts, particularly bivalent metallic sulfamate salts, are highly effective in systems requiring fast release of nutrient, such as foliar applications and

fertigation. Secondary macro and micro nutrients are released upon application, and are much less affected by weather and other conditions.

9. In Von Locquenghien et al, the preferred metal of choice is sodium or potassium (claims 4 and 5), i.e., monovalent cations. According to Chemistry of the Elements (p. 742), alkali metal salts are stable in neutral and alkaline solutions. In contrast, bivalent metallic sulfamate salts are stable in acidic solutions, below pH 2. Notably, the present plant nutrient composition, both stock and diluted versions, are acidic.

10. In Von Locquenghien et al, **the use of alkali and other bivalent metals would result in metallic phosphate precipitation**. In contrast, in accordance with the claimed invention, metallic sulfamate salts with bivalent metals result in complexes with low pH and compatible with phosphates, avoiding metallic phosphate precipitation.

11. In Von Locquenghien et al, the primary objective is to provide a source of nitrogen fertilizer and then small amounts of secondary macro and micro nutrients, which should be further **supplemented by other sources of secondary and other micro nutrients** (p. 3, left col., lns 10-6). The acknowledgement of the need to supplement secondary and other micro nutrients by other sources indicates that Von Locquenghien et al **lack sufficient amounts of metal in the molecule or means of delivering metallic nutrients in a timely and controllable way**. For instance, gypsum may be used as fertilizer but it releases the metal slowly due to low solubility and in uncontrollable fashion.

12. In contrast, bivalent metallic sulfamates, in accordance with the claimed invention, can supply a **high proportion of metal to the total molecular weight** while at the same time **it can provide a sufficient amount of chemically stable and balanced metallic secondary macro and micro nutrients to any mixture of nitrates and phosphates**. No further supplements of secondary macros and micro nutrients are required.

13. Von Locquenghien et al disclose the use of di-ureid agents which *slow the release* of nitrogen and other nutrients (p.2, right col., lns 21-23). Thus, Von Locquenghien et al add

nitrifying agent *to lower solubility* in water that requires urea-containing potassium sulfonate rather than metallic-containing sulfamate. Thus, *arguendo*, even if Von Locquenghien et al were to disclose a complete or improved fertilizer, as the Examiner suggests, Von Locquenghien et al would *teach away* from such a chemical combination *by making the release of nutrients slower and uncontrollable in foliar and fertigation or by making it less complete of essential metals, either by lowering the percentage of metals in the molecule, by displacement reaction or by precipitation of bivalent metals from the sulfonate.*

Clearly, one skilled in the art would be neither motivated nor enabled to make and use the claimed invention in view of the cited references. Rather, one skilled in the art would be taught away from the claimed invention.

Finally, the objection to claim 81 is deemed moot in view of the above amendment.

Claims 80-83, 86-87, 89-91, 93-96 and 98 stand rejected under 35 USC 112, first paragraph.

However, in view of the above amendments, this ground of rejection is moot.

Claims 80-83, 86-91, 93-96 and 98 stand rejected under 35 USC 112, second paragraph.

However, in view of the above amendment, this ground of rejection is moot.

Hence, this ground of rejection is unsustainable and should be withdrawn.

Further, attached herewith is a Rule 132 Declaration of Cheng Wu, the President of GroWonders Corp., who demonstrates that both the stock and dilute compositions as claimed exhibit an inherently low pH in the acidic range. That is, both the stock and dilute compositions are inherently acidic. Generally, the pH of the stock compositions as claimed is less than 2, i.e., typically between 1 and 2. The pH of the dilute compositions is generally less than 5, i.e., typically between 3 and 4.5.

In all cases, however, bivalent sulfamates, themselves, form a very low (acidic) pH solution and they must be stored or mixed at that low pH with phosphates and ammonium nitrate, for example. A pH in the basic range ($\text{pH} > 7$) interferes with storage stability due to precipitation. This low pH may be readily appreciated from column 4, Example IV of Fisher, U.S. 3,321,273. Notably, a prepared cadmium sulfamate solution exhibited a pH of 2.1. A copy of column 4 of Fisher is attached to this Amendment.

Finally, Applicant is not aware that any of the terms used in claim 87 constitute trademarks. Rather, it is noted that mineral terms in geology, such as limestone, differ from the corresponding term in chemistry, i.e., calcium carbonate.

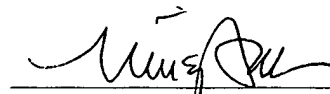
CONCLUSION

Accordingly, in view of the above amendments and attendant remarks, it is believed that the present application now stands in condition for allowance. Early notice to this effect is earnestly solicited.

The Examiner is welcomed to telephone the undersigned attorney if she has any questions or comments in an effort to expedite prosecution.

In the event this paper is not timely filed, Applicant hereby petitions for an appropriate extension of time. Please charge any fee deficiency or credit any overpayment to Deposit Account No. 14-0112.

Respectfully submitted,
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